Linder
Contribution
No. 20

An Annoted Bibliography
[Annotated]
For The Student
Of
Texas Fishes and Fisheries
With
Material On The Gulf of Mexico
And The
Caribbean Sea

By

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LeSueur

source of profit and pleasure. M.B.T.G.F.O.C. 3(3): 4,8. Some data on such lakes in Texas

746. Idem -1940b- Fertilize for fish. M.B.T.G.F.O.C. 3(4): 2,8. General.

747. Idem -1940c- Rules for stocking ponds. M.B.T.G.F.O.C. 3(7): 2, 5, 7. General.

748. LINDNER, MILTON J. -1939- The cooperative shrimp investigations, 13th Biennial Rept. La. Dept. Conser., 447-455. The Texas program which has been conducted by Kenneth H. Mosher has been primarily that of sampling the commercial fishery, but during the past two seasons, through the assistance of Albert Collier, Marine Biologist of the Texas Game, Fish and Oyster Commission, tagging operations have been added.

It is known that temperature and salinity affect the behavior of the shrimp and during the past year it was determined that the tides also enter as a factor. In the vicinity of Corpus Christi, Texas, it was found that better catches of shrimp, as a rule, were made during periods of low rather than during periods of high water.

The Texas coastal area is generally characterized by wide and at times rapid fluctuations in temperature and salinity of the water which apparently results in sudden and yet unexplained reactions and movements of the shrimp. In order to arrive at a better understanding of the behavior of the shrimp in relation to environmental changes a new program of investigation, conducted by Mr. Collier, will be initiated in January, 1938. This survey will include Aransas, Copano, and Mesquite Bays and the Gulf of Mexico adjacent to Aransas Pass. A series of stations has been established in these areas and they will be visted once each week. At each station trawl samples of the bottom fauna will be taken, surface and bottom temperature and salinity observations will be made and plankton hauls will be secured. Shore seining stations will be occupied also at regular intervals and current observations in the several Bays will be made with Skogsberg floats. The present tagging program to determine the migrations and growth of the shrimp will be continued.

Author's Note: The following survey of Texas fisheries was made during the war, and issued as a mimiographed sheet, while much of it is devoted to war time problems, so much

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of it is devoted to war time problems, so much of it is pertinent to the fishery today that I have included such portions in their entirety, as being the most recent and comprehensive survey of the fisheries of the state. JLB.

749. Idem -1941c- The Texas fisheries, mimeo, issued during the war. "Due to the many requests from the fishery industry of Texas directed to the Coordinator of Fisheries a survey of Texas fisheries was made to determine the need for increased fish production; and if such a need was present, the methods by which an increase in catch could bemade without seriously endangering the future supply.

"Texas, for a number of years, has not produced enough fish to supply her own markets. In 1940 the population of Texas was over 6,400,000 persons. According to State records the fisheries of Texas have had an average annual production for the past five years of about 20,000,000 pounds--or about 3 pounds per person per year. Of this amount slightly over 70 percent was shrimp. At the present time, oysters are imported from Maryland and Louisiana, frozen fish from New England, and from 5,000,000 to 8,000,000 pounds of fresh fish are imported each year from Mexico. The demand for fishery products has been increasing and with the threatened rationing of meat, it is anticipated that there will be a still greater demand for marine products.

"Because so many pounds of fishery products must be imported into Texas each year, it would be decidedly advantageous at the present time if the fisheries of Texas could be made more productive. This not only would help remedy the threatened food shortage, but it would also alleviate some of the transportation problems by having the source of supply closer to the markets.

"To utilize most advantageously the fishery resources of Texas and to increase the production of fish in that state will require the cooperation of both the Federal and the State Governments.

"There are four requisites for the accomplishment of these objectives:

"1. Permanent deferment of experienced or key men--both fishermen and plant men.

"2. Facilitate the acquiring of new gear and the replacement of wornout parts and motors.

"3. Create markets for unutilized species and divert some of the fishing effort into these fisheries.

"4. Relax certain of the State regulations to permit greater efficiency of the available fishing effort into these fisheries.

"The first two of the above are solely Federal problems; the third is a joint problem for both the State and Federal Governments and the fourth, with which this report is primarily concerned, is principally a State problem."....

(Lindner here considers labor and material shortages. Consequently this portion of the report is omitted).

"The well-established fisheries for trout, drum and redfish cannot be expected to yield as many pounds of fish as required. To greatly increase the poundage from Texas waters a market must be created for unutilized species and fishing effort diverted to the capture of them. The mullet is the most promising of the unutilized species.

"Although possibly somewhat extraneous it should also be brought out that for the past several years more market fish have been brought into Texas from Mexico by American firms in Brownsville than have been caught in the State of Texas.....

"The State of Texas is principally concerned with the problem: Can more pounds of marine products be taken from Texas waters without depleting the spawning stock? As with the exception of the sheepshead there does not appear to be a depletion of spawners in the Texas fisheries, we believe the answer to this question to be: Yes, provided the fishery is adequately managed.

"The management methods suggested are as follows:

"1. For the duration of the war the control of the Texas fisheries should be placed under the complete jurisdiction of the Coastal Director of the Game, Fish and Oyster Commission, who should have the advice of experienced fishery biologists in his own employ and of the Fish and Wildlife Service.

"2. Allow the use of nets including the drag seine, gill and trammel nets in all of both the lower and the upper Laguna Madre, Nueces Bay, Redfish Bay, Copano Bay,

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St. Charles Bay, Harankawa Bay and East and West Galveston Bays. The regulations governing rope sizes should be removed in order to allow the proper use of the above gear. The drag seine should not be allowed to haul out in water of depth less than 12 inches.

"The otter or shrimp trawl, however, should, for the time being be restricted to those areas at present open to this type of gear.

"3. Change the size limits on the speckled trout, redfish and drum as follows:

"a. Increase the minimum size limit on speckled trout from 12 to 14 inches.

"b. Increase the minimum size limit on redfish from 12 to 16 inches and the maximum size limit from 32 to 35 inches.

"c. Increase the minimum size limit on drum from 8 to 12 inches and the maximum size limit from 20 to 26 inches.

"4. The restrictions pertaining to fishing in the passes should be continued in force.

"5. No changes in the current State laws relative to shrimp fishing are recommended for the present. However, it should be brought to the attention of the armed forces that further restrictions affecting the shrimp fishery will seriously curtail the catch.

"6. The recommendations recently made by Dr. Paul Galtsoff, of the Fish and Wildlife Service, for the rehabilitation of the Texas oyster industry should be placed into effect.

"7. The taking of sheepshead should be prohibited for the time being.

"8. The statistical program of the Coastal Division should be rigidly followed in order to determine the trend of the fisheries.

"9. The provisions pertaining to the non-resident fishermen license should be so modified as to permit the use of such fishermen when it would be advantageous for the

development of new fisheries.

PRESENT IMPORTANCE OF FISHERIES

"Texas has practically a one-fish fishery--shrimp--according to State records of all the marine fishery products landed in Texas for the five year period from September 1, 1937 to August 31, 1942, the shrimp have averaged about 71 percent; trout, redfish and drum 15 percent; redsnapper, 6 percent; oysters, 5 percent. For this same period the total catch has approximated 20,000,000 pounds annually.

"For the fiscal year ending August 31, 1942, according to the records of the Texas Game, Fish and Oyster Commission, 22,633,000 pounds of marine food products were landed by Texas fishermen. The shrimp, as usual during recent years, were decidely pre-eminent yielding a total of 18,112,000 pounds. The speckled trout ranked second with a catch of 1,083,000 pounds; redsnappers were third with 893,000 pounds; redfish fourth with 760,000 pounds; drum fifth with 744,000 pounds; oysters sixth with 664,000 pounds and flounder seventh with 166,000 pounds. The remaining fisheries yielded less than 100,000 pounds each.

"With the exception of the oyster harvest, the principal bay fisheries (trout, redfish and drum) showed a decided increase in catch over the two immediately preceding years. The shrimp fishery was up over 4,000,000 pounds above the preceding year and the redsnapper dropped over 300,000 from the year before.

"The probable reasons of the increase and decrease of the fisheries will be discussed in later paragraphs.

SHRIMP FISHERY

"The shrimp fishery, which is by far the most important fishery of Texas, is in a very healthy condition. There is no evidence of depletion. The 1941-42 catch of over 18,000,000 pounds was the largest on record.

"Under the prevailing conditions it is not anticipated that an increase can be made in the Texas shrimp catch. The problem is chiefly one of attempting to maintain present production.

"For the present, the State laws appear entirely adequate and no changes are recommended in the regulations

governing this fishery at this time.....

"More rigid restrictions of the fishing boats or of the fishing grounds would definitely reduce the shrimp catch as there are few inside waters that could be profitably opened to fishing by the State. Any additional waters that could possibly be opened by the State to shrimp fishing would result in the taking of smaller shrimp, which usually is not good policy either from the standpoint of the shrimp population, the poundage of shrimp ultimately derived from the fishery or in the saleability and price received for the product. Nevertheless, if it is essential that the military regulations become more severe and the pressure for marine food more intense, it may be advisable at that time to make some changes in the State regulations. At present, they should remain as they are....."

(Lindner here discusses military regulations as affecting the catch).

"The large catch of shrimp made in Texas during the past year probably can be attributed to two main causes. First, and primarily, there was an evident greater abundance of shrimp on the fishing grounds along the western coast during the spring. Second, there was a change in fishing methods in that the fishing fleet for the first time became highly migratory--the boats moving along the coast to those areas where the best runs were occurring.

"The shrimp are taken chiefly by otter trawls, although for bait purposes, cast nets, minnow seines and push nets are allowed.

"There are two shrimp canneries in Texas, one at Palacios and the other at Aransas Pass, although the bulk of the Texas catch is marketed as frozen or fresh headless. Available freezers are located at Galveston, Palacios, Port Lavaca and Harlingen.

"In contrast to the fish catch, most of the shrimp catch comes from the eastern half of the seacoast, that is from Corpus Christi to the Louisiana border. The inside waters of the western half of the State (Laguna Madre) are closed completely and south of Corpus Christi Pass the only good fishing ground is off Brazos Santiago Pass.

SPECKLED TROUT, DRUM AND REDFISH FISHERY

"The fishery for speckled trout, redfish and drum

yields most of the poundage coming from the bay fisheries. Together they are the second ranking fishery of the State averaging about 15 percent of the total catch for the past 5 years. In recent years they appear to have suffered heavy mortality due to natural causes but it seems that they are now recovering rapidly and apparently there is a sufficient stock of breeding adults.

"The principal effect of the war has been to close more of the already greatly restricted fishing grounds and to create the everywhere-present shortage of labor.

"In the Laguna Madre area, where most of these species are taken, the military has restricted the bay shoreline of Padre Island and there also have been erected several bombing targets. The fishermen state that the bombing causes very little destruction of fish so the major handicap comes from the decrease in fishing area. There has also been an increasing loss of fishermen to the armed forces and to other more lucrative activities. The loss is greatest among the groupe known as casual fishermen.

"The greatest bone of contention in Texas for many years has been these bay fisheries for trout, redfish and drum. This has had its origin in the old dispute between sport and commercial fishermen. Since the entry of the United States into the war there has been a decline in sport fishermen and the forthcoming gasoline rationing undoubtedly will eliminate most sport fishing. It can be expected that the catch of the sport fishermen, which officials of the Texas Game, Fish and Oyster Commission estimate to be about equal in poundage to the commercial fish catch, will show an extremely pronounced drop. This will affect largely only the trout and the redfish, for the drum is not particularly sought after for sport purposes. The decline in the sport catch should therefore make available additional poundage for the commercial fishermen.

"The question now arises, will the poundage made available through the dropping off of the sport catch be absorbed by an increased commercial catch? This does not seem likely under the present State regulations as there has already been a decrease, and apparently there will continue to be a decrease, in commercial fishermen. Furthermore, the burden of producing an increased catch would fall on the most inefficient type of fishing gear, namely the hook and line. It would appear, therefore, if an increased catch from these bay fisheries is to be secured some of the

areas that are closed to commercial net fishermen should be reopened to them.

"This now brings up the matter of the drag seine which undoubtedly is the most efficient commercial gear for the bay fisheries. Apparently because of its very great efficiency this type of gear has been banned from the inside waters of the State, although it is understood that it is still used surreptitiously in the Lower Laguna Madre (where, rather pointedly, the majority of the catch of these fishes are taken. Furthermore, this gear has been used extensively for these same species in Laguna Madre in Mexico for the past 7 years. During this time this Mexican fishery has been producing about twice the amount of all these species caught commercially in Texas). The available records indicate that the drag seine is an efficient but not necessarily a destructive type of gear. Pearson (1929), who himself used this gear and observed its use many times by the commercial fishermen, maintained that if this net was not hauled out on shore it was not destructive.

"Because of the efficiency of this type of gear, the need for an increased fish production in Texas, and the shortage of fishermen, we are of the opinion that the use of drag seines should be allowed for as long as these conditions exist. It is probable, due to a shortage of fishermen experienced in handling this type of gear, that not many drag-seine units not available will be spread out and add to the individual efficiency of each.

VARIATIONS IN ABUNDANCE

"Unfortunately the statistics covering the past years of the Texas fishery are not very satisfactory and only general impressions can as a rule be gotten from them. The best review of the Texas fisheries is that by Higgins and Ford (1927). Their work and that of Pearson (1929) gave rather convincing evidence that up to that time there was no indication of depletion in the major bay fisheries for trout, drum and redfish. It was the opinion of these workers that legal restriction rather than scarcity of fish was the principal cause for the lack of increased productivity of this fishery.

"The first Texas fishing laws, passed in 1895, had as their objective the closure of certain bays to commercial fishing. Since that time, with the exception of the war years (1916 through 1918 when all restrictions were removed)

there have been increasing restrictions placed upon the bay fisheries. This has included the elimination of the drag gear in the early years, and the almost complete closure of the eastern half of the State to net fishermen. Much of the better fishing grounds in the central portion of the State have also been closed to commercial net fishing. The result of this has been to shift the fisheries from the eastern and central portions of the State into Laguna Madre and particularly Lower Laguna Madre near Port Isabel. As an example of this, the Galveston area which in 1890 produced 1,112,000 pounds of redfish, trout and sheepshead (drum was not utilized in the early years) produced in 1941-42 only 37,000 pounds of redfish, trout and drum (no sheepshead shown as produced in Galveston Bay in 1941-42). The Laguna Madre area in 1890 produced 25,000 pounds of redfish, trout and sheepshead while in 1941-42 this area produced 1,096,000 pounds of trout and redfish and in addition 628,000 pounds of drum (no sheepshead recorded for this area in 1941-42). Of almost 4,000,000 pounds of fish taken in Texas bays in 1890, Galveston Bay produced 38 percent and Laguna Madre only 2 percent. In 1941-42, on the other hand, of 2,700,000 pounds of fish produced in Texas bays, Galveston produced only 2 percent and Laguna Madre 64 percent.

"In addition to the areas closed by the State, the Army and Navy have recently closed vast areas for bombing and gunnery ranges. The principal ones affecting the bay fisheries are those in Matagorda Bay and Laguna Madre.

"Since the time covered by the reports of Higgins and Lord (1927) and Pearson (1929) the restrictions have become still more rigid and it appears that up until 1937-38 there probably was no serious depletion in these three fish populations. In 1936 the Texas Game, Fish and Oyster Commission instituted a new method of gathering fish statistics not based upon a poundage tax as had been the case in previous years when the State gathered records. Although still not entirely satisfactory this system was a considerable improvement over the previous method. During the first year (September 1936 through August 1937), at least, of its operation the catches undoubtedly were greater than indicated by the State reports. For the past several years, however, they undoubtedly represent fairly well the trend of the fisheries; particularly so, inasmuch as during the period covered by these figures there have been no major changes in the fishery laws.

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"The drum, trout, and redfish show a decided and continual drop in production from the fiscal year 1937-38 to a low in 1939-40 for the trout and 1940-41 for the redfish and drum. The trout showed a slight rise in 1940-41 and a greater one in 1941-42. The 1941-42 catch of trout, nevertheless, is still considerably less than that of 1937-38. The redfish showed a remarkable recovery in 1941-42 almost approximating the height of the 1937-38 fishery. The drum also showed a definite recovery in 1941-42, but it is still well below that of the 1937-38 showing the least proportional recovery of any of the three species. The more rapid recovery of the redfish can probably be attributed to its faster rate of growth.

"There does not appear to have been any appreciable change in the fishing laws or the fishing effort during this period. It, therefore, is believed that these fluctuations represent fairly well the actual variations in the abundance of trout, redfish and drum on the fishing grounds. The question now arises, was this serious decrease in abundance due to natural or to made-made causes? We have been unable to find any evidence that would lead us to believe that this decrease was due to fishing or to man. On the other hand, certain natural events transpired which where known to have caused the death of many thousands of fish and which are definitely correlated in time sequence with the decline in abundance.

"In July 1938, the Upper Laguna Madre embracing Baffin and Alazan Bays became quite salty and many fishes were killed. This condition persisted throughout the summer of 1939. In 1940, however, the salinity decreased and in the summers of 1941 and 1942 conditions in this area were normal. For almost 2 years one of the major commercial fishing grounds of the State was "knocked out" of production both for the commercial fishery and as a nursery and feeding ground for the fishes. On top of this, in January 1940, one of the severest freezes on record struck the Texas coast killing a tremendous quantity of these fishes in the shallow bays.

"It appears that these natural phenomena were the causes for the decline in abundance of these fishes on the fishing grounds. This decline would be reflected in the annual records of the Texas Game, Fish and Oyster Commission for the years from 1938-39 through 1940-41. This is further borne out by the fact that during the fiscal year 1941-42 conditions on the fishing showed a decided

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increased catch over the preceding year in spite of the fact that according to the Coastal Division of the Texas Game, Fish and Oyster Commission there were fewer fishermen in 1941-42 than in 1940-41.

"Freezes and periods of excessive salinity have occurred frequently in the past (see Gunter, 1941; Higgins and Lord, 1927; Pearson, 1929) and on each occasion when the causative agent disappeared there was a rapid return of the fish population to normal in spite of any fishing that may have been going on. The great increase in the 1941-42 catches for these three species over that of the preceding year is evidence of the fact that these fishes are well on their way to recovery. Further the great abundance of young fish during the past two years indicates that there is a sufficiency of spawners.

"With these three species, under the conditions as they have been in the past in Texas, the success of spawning appears to be governed primarily by natural conditions rather than by the number of spawners. This is evidenced by the above.

"For these reasons we believe that in spite of increased fishing that may result from the war, the population of these fishes in the bays will return to their accustomed level within a short period of time.

SIZE LIMITS

"Size limits, both minimum and maximum, have been applied in Texas as a conservation measure for a number of years. These size limits were for the purpose of protecting both the young and the spawners, and to prohibit the marketing of the less desirable (from a commercial standpoint) sizes. At the time these laws were instituted there was no trade demand for either very small or very large drum or redfish. The large fish brought a much lower price than the intermediate sizes and frequently they were discarded. At present, however, there is a definite demand and a ready sale for both large drum and redfish.

"In general it is good practice in the management of a fishery to afford protection to the small fish and allow taking of the larger ones. In this way greater poundage can be taken from the fishery without taking a greater number of fish. The young, rapidly growing fish are merely allowed to put on more weight before they are caught.

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"From the information that is available it appears that a revamping of the Texas size limits would result in a greater poundage of fish from the fishery without an increased catch of individual fish.

SPECKLED TROUT

"The present Texas regulations prohibit the taking of speckled trout less than 12 inches in total length. There is no maximum size limit on trout.

"According to Pearson a 12-inch trout is 3 years old and weighs about one-half pound. A 14-inch trout would be 4 years of age and weigh approximately three-quarters of a pound. By affording protection to the trout for another year each individual fish would increase its weightby about 50 percent. Because of the abundance of trout 14 inches and over, it is probable that the loss in total poundage to the fishery through natural mortality would not be as great as the gain resulting from growth if this protection were afforded. Furthermore, most of all the fish taken would have had an opportunity to spawn before they were captured if the minimum size limit were increased 2 inches. (According to Pearson maturity is reached when the trout attain a size of about 12 inches). In addition, there is not as ready a sale for the 12-inch as for 14-inch trout.

REDFISH

"Redfish are protected by both a minimum (12 inches) and a maximum (32 inches) size limit.

"According to Pearson a redfish is about 13,4 inches at the end of the first year and about 21.3 inches at the end of the second year. Maturity is reached at about the end of the fourth or fifth year as very few fish under 30 inches are sexually mature. A 12-inch fish weighs about one-half pound, a 16-inch fish about 1 1/2 pounds and a 21.3 inch fish about 4 pounds. As can be seen the redfish grows very rapidly. If the minimum size limit were increased from 12 to 16 inches the young fish would have to be protected for only about 6 months more and in this period of time it would have tripled its weight. It would seem that affording this additional protection would certainly be a paying proposition. There is further reason for increasing the size limit inasmuch as 12-inch redfish are not a highly desired market size.

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"At the time the maximum size limit of 32 inches was placed on redfish there was practically no commercial demand for fish of larger size. Now, however, there is a definite market for "bull reds" for the restaurant trade and Army camps and as steak fish. As there appears to be a sufficiency of redfish spawners (as evidenced by their rapid recovery following the freeze) we believe that the maximum size limit for this species could be increased safely to 35 inches.

"This species attains a length of about 5 feet and a weight of about 75 pounds (Breder, 1929).

DRUM

"The current size limits for drum are an 8-inch minimum and a 20-inch maximum.

"According to Pearson the drum is approximately 9.8 inches in length at the end of the first year and about 14.5 inches at the end of the second year. An 8-inch drum weighs about one-half pound and a 12-inch drum about 1 pound. By increasing the minimum size limit from 8 to 12 inches the small drum would have an opportunity to double its weight before being subjected to the commercial fishery. Like the redfish, the small drum is not desirable for market.

"The maximum size of 20 inches was placed on the drum because at the time this law was enacted the market for fish of greater size was extremely poor. Now, however, there is a definite demand for larger drum and it is probable that the maximum limit can be increased safely to 26 inches as the spawning population appears to be adequate.

"The drum attains a length of over 4 feet and a weight of about 146 pounds (Breder, 1929).

REDSNAPPER

"The redsnapper fishery, the third ranking fishery of the State, due to the war and further to a shortage of labor has shown an appreciable decline (over 500,000 pounds in 1941-42 from 1940-41). This is a handline fishery operating from Galveston principally, and Port Isabel secondarily. From the reports of the fishermen it appears that this fishery has been suffering from intensive fishing for some years. It is probable that the decreased fishing

effort caused by the war will be beneficial in the long run. An increased fishing effort might easily result in a further decline in the abundance of this species.

"It appears probable that the decline in the yield of the snapper fishery in 1941-42, below that of the preceding years can be attributed directly to decreased fishing activity. Because of submarine activities and the difficulty of obtaining crews, the Port Isabel fleet was laid up for several months and but little fishing is now going on from this port. At Galveston the trouble has been mainly that of getting crews. On an average between 20 and 30 percent of the Galveston fleet has been laid up since the war due to the scarcity of men. There is no immediate prospect of this condition being ameliorated.

"The snapper fishery is conducted over banks or reefs in the offshore waters of the Gulf of Mexico beyond the jurisdiction of the state. The fishing grounds are generally considered to occur in two zones. That known as the local fishery extends at various spots along the Texas coast and south off the Mexican coast to about Punta Jerez Light. The second zone consists of Campeche Bank off the coast of Yucatan. The Galveston boats frequent both the local ground and Campeche Banks. - The Port Isabel fishery, on the other hand, is limited to the local grounds.

SHEEPSHEAD

"The sheepshead in 1890, with a catch of almost 800,000 pounds, was the third ranking Texas fishery. Since that time it has declined alarmingly until in 1941-42 slightly more than 2,000 pounds were reported. Some of this decline can undoubtedly be attributed to the closure of the best sheepshead area to the most efficient type of gear. It does not appear plausible, however, that this is the sole explanation. Rather, it seems that this species has undergone serious depletion. Undoubtedly the 1940 freeze caused damage to the remaining sheepshead population (Gunter, 1941), however, the catch prior to the freeze was also negligible in comparison to that of the 1890's.

"From the experience in other places, namely Chesapeake Bay (Hildebrand and Schroeder, 1928) and North Carolina (Hildebrand and Cable, 1938) it is

evident that the sheepshead has suffered serious depletion in these two localities. Hildebrand and Cable (1938, page 534) stated "A slow rate of growth and late maturity would explain, in part at least, why the sheepshead has diminished rapidly under heavy fishing, whereas other, presumably faster growing, species have withstood it without a serious decline."

"Because so little is known concerning the sheepshead, because of its probable serious decline in Texas, and because of its seeming depletion in other areas due to heavy fishing we recommend that in Texas it be taken from the list of commercial fishes and afforded full protection until such time that it is evident that this species can support a commercial fishery.

OYSTERS

"The Texas oyster fishery, which is now the fourth ranking fishery of the State, has been on the downgrade for many years. No discussion of this fishery will be included here as Dr. Paul S. Galtsoff, of the Fish and Wildlife Service, made a survey of the Texas oyster industry early in 1942 and submitted recommendations for the improvement of this industry. These recommendations have been published in their entirety by the Coastal Division of the Texas Game, Fish and Oyster Commission.

UNUTILIZED SPECIES

"It is probable that the edible fish catch of Texas could at least be doubled if greater utilization were made of such species as the mullet, menhaden, Spanish and king mackerel, and the sea catfish. The crab fishery could also be made to produce many more pounds.

"There is no denying the fact that the productivity of the already established Texas fishery for trout, drum and redfish is limited. It is doubtful that this fishery can be made to yield more than double (if that much) its normal level. Any greatly increased productivity will have to come from fishery resources that are not now tapped. Of these the mullet appears most promising. The menhaden would be handicapped by the coastal military restrictions and by lack of the necessary boats, canning and/or reduction plants. The

crab would require additional labor for pickers. This labor is not available, unless it could be imported from Mexico. The mackerels would probably require the introduction of new and expensive gear that are not now available. (The Game, Fish and Oyster Commission is planning experiments next season with the inexpensive drift line. If this proves successful the mackerel fishery may increase considerably). The sea catfish does not seem to be as abundant as the mullet, nor is it as susceptible to capture in schools as is the mullet.

"Although having a ready sale in the southeastern states there is no market for mullet in Texas, only 7,000 pounds being reported for the State last year. (The entire South could produce considerably more mullet if the demand were greater. Florida, the chief mullet producing state, has reported trouble in marketing her catch). Gunter (1942) estimates that at least 4,000,000 pounds of mullet could be gotten each year from Texas waters. At the same time, if there was a market, vast quantities could be imported from Mexico. We have been informed that if it is a satisfactory product, either salted, or preferably, dried, and can be produced in sufficient quantities, Lend-Lease will provide the sales outlet.

"The Texas Game, Fish and Oyster Commission and the Committee on Texas Marine Resources are both actively engaged in attempting to popularize mullet within Texas. These endeavours should be given full encouragement. (A campaign should also be initiated to introduce mullet in States where it is not now sold.) Such efforts, coupled with the fact that as the demand for fish increases, there automatically will unfold markets for such species, should result in the development of this fishery. It is possible that the mullet fishery will expand in this war as did the drum in the last.

"As the taking of mullet requires gear and experience not now available in Texas, it would be advantageous to modify the non-resident commercial fisherman's license to facilitate the importation of non-resident fishermen. The present fee for a non-resident fishermen is $200.00 per year, whereas it is but $3.00 for a resident fisherman.

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MANAGEMENT OF THE FISHERIES

"At present the control of the Texas fisheries is vested in the legislature of Texas which meets every 2 years. While this may be highly desirable and perfectly satisfactory during normal times such is not the case during this war where rapidly changing conditions almost always require immediate action.

"In order to fully and adequately manage the fisheries of Texas a great deal more information is needed than is presently known about the migrations and abundance of the various species. The emergency demand for an increased production of food cannot, however, await the determination of these facts. There is need for immediate action based upon available information, inadequate as this information may be. The recommendations herein set forth are our opinions resulting from an analysis of the available information.

"Because all of the necessary information required for proper management of these fisheries is not known, these recommendations may not be entirely satisfactory. For this reason close observation should be maintained of the fisheries and any changes required in the regulations should be put into effect as soon as possible. This can be most satisfactorily accomplished if, for the duration of the war, the fisheries are placed under the control of one man who is given full authority. This man should have the advice and counsel of trained and experienced fishery biologists.

"The rapidly changing economic complexities make it extremely difficult to foresee what next may arise or what changes might suddenly be needed to get the most from the commercial fisheries. With the fisheries under the control of one person these adjustments could be made much more rapidly, and consequently, more satisfactory than possible at present.

BROWNSVILLE IMPORT FISHERY

"Since 1935, from 4 to 6 million pounds of fish have been brought into Brownsville each year from the Laguna Madre in Mexico. The fish are caught by Mexican drag seine crews who are furnished with all gear, equipment, ice and trucks by the American dealers.

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There are nine such dealers now operating in Brownsville. Trucks equipped with special tires haul the fish from the fishing grounds to Brownsville. The roads are impassable to the trucks unless they are so equipped.

"Various attempts by ordinary truck and by plane had been made to bring fish from the Laguna into Texas but without success until in 1935 a truck equipped with marsh buggy tires was introduced. The success of the innovation immediately induced others into the fishery and it developed rapidly.

"The fish imported are principally trout and redfish, although croakers, robalo, drum, pompano, etc., are also brought in. There is a Mexican export duty of about 1 1/4 cent per pound and an American import duty of 1 cent per pound on all fish. It is reported that the drum catch could be increased greatly if it were not for these duties. The drum is a low priced fish and it does not now pay to import it in any quantities....."

750. LINGAN, JAMES -1943- Fliers train in angler's paradise. T.G.F. 1(5): 8, 17. Fishing off Matagorda Island.

751. LINTON, EDWIN -1908- Helminth fauna of the Dry Tortugas. I. Cestodes. Pap. Tort. Lab. Carn. Inst. 1: [illegible]7-190. No Texas material, but covers the parasites of so many forms found in this state that it could not well be omitted.

752. Ædem -1910- Helminth fauna of the Dry Tortugas. II. Trematodes. Pap. Tort. Lab. Carn. Inst. 4: 11-98, 28 pls. Contains no Texas material but covers the parasites of so many forms found in this state that it could not well be omitted.

753. LOCKWOOD, MASON G. ET AL -1947- A study of food freezing and cold storage plant for the town of Freeport. 41 pp., 2 charts, bibliog. Privately printed. A survey of the potential production of seafood in the Freeport area with a view to establishing a quick-freezing plant. An excellent resume of the situation with a good deal of material on the economic aspects.

754. LONGLEY, WILLIAM H., and SAMUEL F. HILDEBRAND